Claims

<u>What is claimed is:</u>

1. A device for measuring the auto-fluorescence of a retina comprising:
   an excitation light source adapted to provide an excitation light at a wavelength corresponding to excitation of flavoprotein auto-fluorescence; and
   an image capture device adapted to record a single image representative of a retinal fluorescence signal generated in response to the excitation light, the image capture device including:
      a filter that reduces background wavelengths from the retina fluorescence signal; and
      an image intensifier adapted to increase the retinal fluorescence signal strength.

2. The device for measuring the auto-fluorescence of a retina of claim 1, wherein the excitation light source is a mercury lamp.

3. The device for measuring the auto-fluorescence of a retina of claim 1, wherein the excitation light source is a laser.

4. The device for measuring the auto-fluorescence of a retina of claim 1, wherein the excitation light is aligned with the retina using a dichroic reflector.

5. The device for measuring the auto-fluorescence of a retina of claim 1, wherein the excitation light is aligned with the retina using a fiber optic system.

6. The device for measuring the auto-fluorescence of a retina of claim 1, wherein the image capture device is a charged coupled device.

7. The device for measuring the auto-fluorescence of a retina of claim 1, wherein the image capture device is a still camera.

8. The device for measuring the auto-fluorescence of a retina of claim 1, wherein the image capture device is a cooled charged coupled device camera.

9. The device for measuring the auto-fluorescence of a retina of claim 1, wherein the image intensifier includes a gain factor of at least 100.

10. The device for measuring the auto-fluorescence of a retina of claim 1, wherein the image capture device has a field of view sized to capture a single image of the retinal fluorescence signal generated by the retina.

11. The device for measuring the auto-fluorescence of a retina of claim 1, further comprising a processor programmed to analyze the retinal fluorescence signal with respect to a second stored retinal fluorescence signal.

12. The device for measuring the auto-fluorescence of a retina of claim 1, further comprising a processor programmed to analyze the retinal fluorescence signal to determine a contrast change.

13. The device for measuring the auto-fluorescence of a retina of claim 12, wherein the processor is programmed to analyze the retinal fluorescence signal to determine a local contrast change.

14. The device for measuring the auto-fluorescence of a retina of claim 12, wherein the processor is programmed to analyze the retinal fluorescence signal to determine a rate of contrast change.

15. The device for measuring the auto-fluorescence of a retina of claim 1, wherein the filter reduces wavelengths beyond those associated with flavoprotein auto-fluorescence.

16. A method of non-invasively measuring the metabolic activity of a retina, the method comprising:
aligning an image detection device with the subject retina;
aligning an excitation light source with the subject retina;
providing an excitation light generated by the excitation light source to induce retinal auto-fluorescence in the subject retina;
capturing a single image representing the induced retinal auto-fluorescence;
intensifying the single image to increase the signal strength of the retinal auto-fluorescence; and
analyzing the single image to determine a contrast.

17. The method of non-invasively measuring metabolic activity of a retina of claim 16, wherein aligning the excitation light source includes aligning a dichroic reflector to direct the excitation light towards the subject retina.

18. The method of non-invasively measuring metabolic activity of a retina of claim 16, wherein aligning the excitation light source includes aligning a fiber optic system to direct the excitation light towards the subject retina.

19. The method of non-invasively measuring metabolic activity of a retina of claim 16, wherein aligning the image detecting device includes aligning a charged coupled device camera.

20. The method of non-invasively measuring metabolic activity of a retina of claim 16, wherein aligning the image detecting device includes aligning a still camera.

21. The method of non-invasively measuring metabolic activity of a retina of claim 20, wherein aligning the image detecting device includes aligning an image intensifier.

22. The method of non-invasively measuring metabolic activity of a retina of claim 16, wherein aligning the excitation light source includes generating the excitation light at an excitation wavelength of about 450nm.

23. The method of non-invasively measuring metabolic activity of a retina of claim 16, further including reducing the amount of ambient light presented to the subject retina.

24. The method of non-invasively measuring metabolic activity of a retina of claim 16, further including filtering the induced retinal auto-fluorescence beyond the wavelengths associated with flavoprotein auto-fluorescence.

25. The method of non-invasively measuring metabolic activity of a retina of claim 16, wherein capturing a single image includes capturing an image representative of the auto-fluorescence specific to flavoproteins.

26. The method of non-invasively measuring metabolic activity of a retina of claim 16, wherein analyzing the single image comparing the single image with a second stored single image.

27. The method of non-invasively measuring metabolic activity of a retina of claim 16, wherein analyzing the single image includes determining a local contrast change.

28. The method of non-invasively measuring metabolic activity of a retina of claim 16, wherein analyzing the single image includes determining a rate of contrast change.

29. The method of non-invasively measuring metabolic activity of a retina of claim 16, further including aligning at least one objective lens between the image detection device and the subject retina.

30. A method of upgrading a standard imaging device to non-invasively measure the metabolic activity of a retina, the method comprising:
replacing a standard light source with an excitation light source for generating a filtered excitation light;
positioning an image detection device to detect a single image representing a retinal auto-fluorescence generated in response to the filtered excitation light; and
increasing the intensity of the single image using an intensifier.

31. The method of upgrading a standard imaging device of claim 30, further comprising positioning a filter between the image detection device and a subject retina to prevent detection of wavelengths beyond those associated with flavoprotein auto-fluorescence.

32. The method of upgrading a standard imaging device of claim 30, wherein providing the excitation light source includes providing a mercury lamp.

33. The method of upgrading a standard imaging device of claim 30, wherein providing the excitation light source includes providing a laser.

34. The method of upgrading a standard imaging device of claim 30, wherein generating the filtered excitation light includes producing light at a wavelength of about 450nm.

35. The method of upgrading a standard imaging device of claim 30, further comprising positioning at least one objective lens to scale the detected single image.